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Research Article

Solar Energy Resource Potentials of the City of Arkadag

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Annotation

The article obtained systematized, scientifically substantiated gross, technical, economic, and environmental energy resource potentials from the introduction and use of solar energy technologies. The technical, economic, and environmental priorities of power plants were assessed in terms of energy efficiency, fuel economy, and the environmental impact per square meter from conversion to thermal and electrical energy in the city of Arkadag.

The calculated results are, kWh/m^2 per year: gross resource potential of solar energy - 1844.6; the technical potential for conversion into thermal and electrical energy is equal to - 1256.44 and 242.44; economic - 502.6 and 96.98 kg fuel equivalent/m^2 per year; environmental reduction in emissions of various harmful substances into the environment when using solar photovoltaic modules in the city of Arkadag will be: with annual electricity generation per m^2 - 242.44 kW·h, annual fuel consumption savings - 96.96 kg. e., the reduction in emissions will be, kg per year: SO_2 – 2.0; NO_x – 1.1; CO – 0.14; CH_4 – 0.29; CO_2 – 155.0; solids – 0.21; when converted into thermal energy per m^2 and annual production of 1256.4 kW·h, annual fuel savings are 502.6 kg of fuel equivalent; emission reduction will be, kg per year: SO_2 – 10.4; NO_x – 5.6; CO – 0.73; CH_4 – 1.53; CO_2 – 803.5; solids – 1.1.

Empirical equations (1-5) have been obtained taking into account the gross, technical, economic, and environmental resource potentials of solar energy in the city of Arkadag, it is possible to carry out energy and environmental forecasting when drawing up a feasibility study.

INTRODUCTION

The idea of building a “smart city” Arkadag belongs to the Leader of the Nation Gurbanguly Berdimuhamedov, it provides for the use of information and communication automated control systems: water supply and energy supply; waste – smart waste; ensuring the mobility of citizens within the city - increasing the efficiency of road use by both personal and public transport, introducing smart transport and smart parking; digitalization and ensuring reliable communications – creating an environment for easy interconnection and exchange of information between citizens; citizen participation in city management – e-government; safe city – ensuring the safety of citizens; accessible e-education and healthcare – smart healthcare, telemedicine, distance learning; environmental protection – control of pollution and noise levels, creation and use of “green” technologies [1-3].

The first “smart” city of Turkmenistan will be equipped with a scaled LoRaWAN (Long Range Wide Area Network), which is an energy-efficient long-distance data transmitter and is characterized by high operating autonomy in a large network area. Electricity, drinking water, and natural gas sensors are installed in the overall LoRaWAN system, which will facilitate the reception of signal data at a distance of 10-15 km via the Ethernet network (a family of technologies for packet data transfer between devices). The basic LoRaWAN system will be able to listen to the air in a given frequency range, send a request from any of the devices, and respond to it at the same frequency. At the same time, the channel width is 125 kHz with a maximum speed of more than 5 kilobits/s. Thus, the device can turn on motion sensors, open and close doors, control the temperature and humidity conditions of the building, monitor water leakage, turn on and off electrical appliances, and remotely control home systems using digital information technologies [2].

Communication will be carried out using the most modern technological system GPON (Gigabit Passive Optical Network), which is a high-speed passive optical network that allows you to